Primary moult, wing-length and mass of the Lesser Honeyguide *Indicator minor*

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Honeyguides (Indicatoridae) exhibit unusual characteristics with respect to their breeding biology, guiding relationship with man, cerophagy, and physiology (Friedmann 1955, Short & Horne 1985). They are the only flying birds with nine primaries, all other species having either 10 or 11 primaries, although in the oscine passerines the outermost primary is tiny (Stresemann & Stephan 1968).

Stresemann & Stresemann (1966) summarised what was then known about the moult of one member of the family, the Greater Honeyguide *Indicator indicator*, giving the moult protocols of seven juveniles and six adults, all museum specimens from central African localities, mostly Cameroon. They concluded that Greater Honeyguides moult their primaries descendently, that adults in Cameroon commence moult in May and complete it in July/August, and that juveniles begin their first primary moult at an age of at most three to four months. No further information of significance has subsequently been published on the moult of this or any other honeyguide.

At the beginning of the 20th century, Lesser Honeyguides *Indicator minor* "were not recorded from near Cape Town", the closest localities being George, Oudtshoorn and Knysna, 300 km to the east (Stark & Sclater 1903). The expansion of the range of the Lesser Honeyguide into the Fynbos Biome of the southwestern extremity of Africa in the 1980s (Hockey *et al.* 1989, Underhill & Underhill 1992 and references therein) has been attributed to the range expansion of its main breeding host in southern Africa, the Acacia Pied Barbet *Tricholaema leucomelaina* (Fry *et al.* 1988). This barbet, in turn, owes its expansion into the fynbos to anthropogenic tree-planting there, especially of invasive *Acacia* spp., providing nest holes for the barbets (Macdonald 1986). However, there is circumstantial evidence that Lesser Honeyguides also parasitise Cardinal Woodpeckers *Dendropicos fuscescens*, Olive Woodpeckers *Mesopicos griseocephalus*, Olive Thrushes *Turdus olivaceus*, European Starlings *Sturnus vulgaris*, and Malachite Sunbirds *Nectarinia famosa* in the southwestern Cape (van der Merwe 1986, Hockey *et al.* 1989, Richardson 1989, Longrigg 1993, Spottiswoode 1994, van Zijl 1994).

The better-known honeyguide species have been shown to be sexually dimorphic, with males larger than females. Apart from the Greater Honeyguide, there are no known plumage differences between the sexes (Friedman 1955, Short & Horne 1985). This size dimorphism is readily observed in wing-length, and the measurements given by, for example, Clancey (1977) and Fry *et al.* (1988) show sufficiently little overlap to suggest that sex determination on this character might prove reliable for birds-in-the-hand. However, the published wing-lengths

were based on museum specimens, which are subject to shrinkage compared with live birds (Vepsäläinen 1968, Knox 1980), and are unlikely to have been made using the "maximum length" technique (Evans 1986) now regarded as standard by bird ringers (Svensson 1992). Of the sources used by Maclean (1993) for wing-length (provided by G. L. Maclean *in litt.*), Clancey (1977) measured museum skins, but Manson (1985) measured live birds with "the wing flattened and straightened", i.e. the standard method.

This paper presents data on primary moult and wing-length for the Lesser Honeyguide near Cape Town, Western Cape, South Africa. Because data on the masses of bird species are regularly needed in theoretical studies (e.g. Payne 1989), the mass data have also been summarised.

Material and methods

Seventy-two Lesser Honeyguides were trapped during mist-netting operations at 10 localities within 30 km of Cape Town. Birds were ringed, aged (first-year birds have indistinct moustachial and subocular stripes; McLachlan & Liversidge 1970) and weighed to 0.5 g (usually using a 50 g Pesola spring balance with 0.5 g divisions). The wing-length was measured to 1 mm or 0.5 mm (maximum chord method, as in Evans 1986), and primary moult scores recorded according to the system described by, for example, Ginn & Melville (1983). The scores for the nine primaries were summed and divided by 45, to produce a "moult index" between 0 (not yet started moult) and 1 (completed moult) (Underhill & Zucchini 1988). The parameters of moult were estimated using data type 2 of Underhill & Zucchini (1988). Data from all ringing localities were pooled for the analyses. All measurements were not made on every bird.

The sexual dimorphism was expected to produce bimodal histograms for wing-length and mass. Under the assumption that these could be modelled as a mixture of two normal distributions, the parameters of the normal distributions, as well as the proportions of the two distributions in the mixture were estimated by the method of maximum likelihood, using directive DISTRIBUTION of Genstat 5.3 (Genstat 5 Committee 1993).

Results and discussion

The maximum likelihood estimaters of the parameters of moult were a mean starting date for primary moult of 8 January, a duration of 140 days, with 28 May as the mean completion date. The estimated standard errors for these parameter estimates were 15, 10 and 9 days, respectively. The large standard errors are a consequence of the small sample size, 68. The standard deviation of the starting date was 35 days (s.e. = 5 days), so that 95% of the birds were estimated to start (and complete) moult within 68 days of the mean starting (and completion) date (Fig. 1). Given that the moult of an individual bird takes place over 4.5 months, and that birds start (and complete) moult between about two months earlier and later than the mean dates, the overall duration of moult in the population

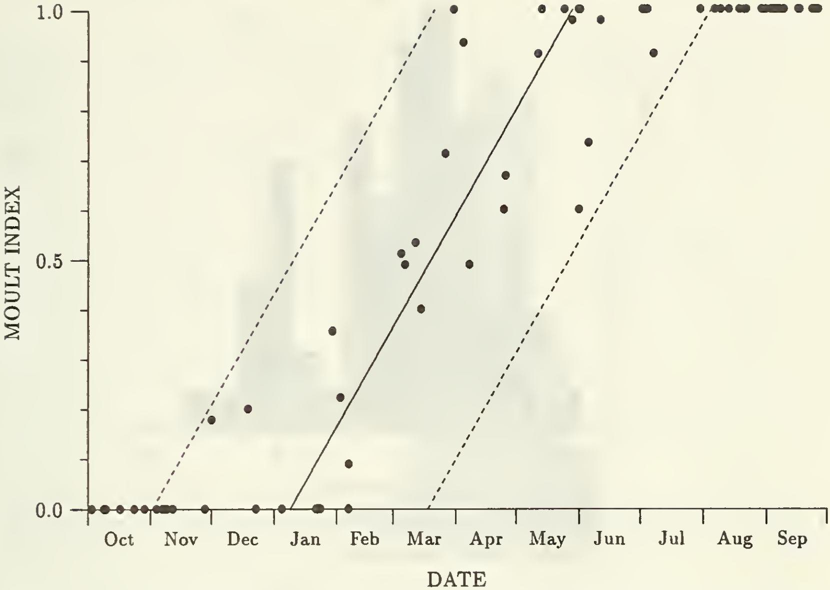

Figure 1. Moult indices for Lesser Honeyguides in the Western Cape. The solid line shows the estimated average progression of primary moult; the parallelogram encloses approximately 95% of all moulting birds.

is about nine months, from early November to late July. This is longer than the February–July period stated for southern Africa by Fry *et al.* (1988).

The distribution of wing-lengths showed clear bimodality (Fig. 2). Assuming that the standard deviations of male and female Lesser Honeyguides are equal, the estimates of mean wing-length of females and males were 88.9 mm and 94.6 mm, respectively (Table 1). To compare the fit of mixtures of two normal distributions with equal and unequal standard deviations, both models are fitted and the difference between the deviances, as computed by Genstat, has a χ^2_1 distribution (Genstat 5 Committee 1993: 330–341). The decrease in deviance (from 21.3 to 17.9) when allowing unequal standard deviations for females and males was not significant (change in deviance=3.4, $P>0.05$) and the assumption of equal standard deviations for females and males is tenable.

The estimated difference in mean wing-length between males and females was 5.7 mm; the 95% confidence interval for the difference, taking the correlation between the estimated parameters into account, was 4.0–7.4 mm. In seven regions in eastern and southern Africa, Clancey (1977) reported inter-sex wing-length differences of between 5.0 mm and 7.0 mm, using sample sizes per sex per region averaging 13 birds; Maclean (1993) reported a difference of 5.8 mm.

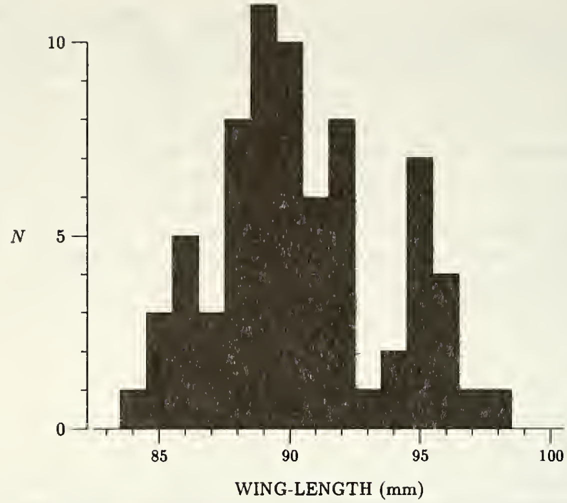

Figure 2. The distribution of wing-lengths of Lesser Honeyguides in the Western Cape.

TABLE 1
Estimates of wing-length parameters for sample of 71 Lesser Honeyguides mist-netted in the Western Cape

Parameter	Estimate	Standard error
Mean for females	88.86	0.37
Mean for males	94.62	0.73
Common standard deviation	2.08	0.23
Proportion of females	0.73	0.07

Clancey's wing-lengths were all of museum specimens, and therefore subject to shrinkage. His mean wing-lengths for the Cape Province and Natal, where the smallest subspecies of the Lesser Honeyguide occurs, were 85.6 mm for females and 91.4 mm for males, both 4% shorter than the wing-lengths from live birds measured by ringers using the maximum chord technique. Typically, shrinkage of wing-length in museum specimens is approximately 2% (e.g. Svensson 1992).

If Lesser Honeyguides are classified as female if their wing-lengths are less than 91.7 mm and male otherwise, approximately 9% will be misclassified. This classification rule applies only to the Western Cape and using the maximum length wing-measuring technique. Because inter-sex wing-length differences and the standard deviations appear to be fairly uniform across the range (Clancey 1977), taking the midpoint

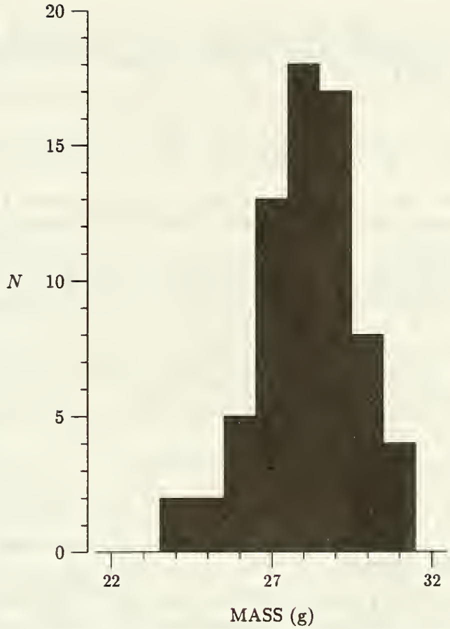

Figure 3. The distribution of masses of Lesser Honeyguides in the Western Cape.

between the means for the sexes would produce roughly the same probability of misclassification.

The percentage of females in the sample of Lesser Honeyguides caught in mist-nets was estimated to be 73% (Table 1). The Lesser Honeyguides were a by-catch, not a target species, and no attempts were made to attract them to the mist-netting sites by providing wax. It therefore seems likely that female Lesser Honeyguides are more mobile than males, and more likely to get caught in randomly (for them) positioned mist-nets. This is consistent with the biology of the species; male Lesser Honeyguides spend long periods of time stationary at "call-sites", the traditional singing perches where mating takes place (Ranger 1955), while females move extensively while searching for the nests of their hosts (Payne 1992).

The distribution of mass showed no bimodality (Fig. 3), and had a mean of 28.3 g and standard deviation 1.6 g (n=69). Maclean (1993) reported a mean mass of 28.2 g.

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